TL-N/TL-Q

CSM_TL-N/TL-Q_DS_E_14_1

A Wealth of Models for All Types of Applications

- Easy installation, high-speed pulse generator, high-speed rotation control, and more.
- Direct mounted to metal (-N Models).
- A wealth of models ideal for limit control, counting control, and other applications (-N Models).



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Ordering Information

Sensors [Refer to Dimensions on page 10.]

DC 2-Wire Models

Appearance Sensing distance					Model		
		Sensing distance			Operation mode		
		NO	NC				
	17×17	5 m	nm		TL-Q5MD1 2M *1 *2	TL-Q5MD2 2M *1	
Unshielded	25 × 25	7	mm		TL-N7MD1 2M *1	TL-N7MD2 2M *1	
	30 ×30		12 m	m	TL-N12MD1 2M *1	TL-N12MD2 2M *1	
	40 × 40			20 mm	TL-N20MD1 2M *1	TL-N20MD2 2M *1	

^{*1.} Models with a different frequency are available to prevent mutual interference. The model numbers are TL-N DD 5 and TL-Q5MD 5 (e.g., TL-N7MD 15).

DC 3-Wire and AC 2-Wire Models

					Model	
Appear	rance	Sensing distance		Output configuration	Operation mode	
1					NO	NC
	8 × 9 2 mm DC 3-wire, NPN		TL-Q2MC1 2M	_		
	17 × 17	5 mm		DC 3-WIIE, INFIN	TL-Q5MC1 2M *1 *2	TL-Q5MC2 2M
	17 × 17	5 111111		DC 3-wire, PNP	TL-Q5MB1 2M	_
	25 × 25			DC 3-wire, NPN	TL-N5ME1 2M *1 *2	TL-N5ME2 2M *1
Unshielded		5 mm		AC 2-wire	TL-N5MY1 2M *1	TL-N5MY2 2M *1
	30 × 30	10 mm	DC 3-wire, NPN	TL-N10ME1 2M *1 *2	TL-N10ME2 2M *1	
1774			n	DC 3-wire, PNP	TL-N10MF1 2M *1	_
				AC 2-wire	TL-N10MY1 2M *1	TL-N10MY2 2M *1
	40 × 40		00	DC 3-wire, NPN	TL-N20ME1 2M *1 *2	TL-N20ME2 2M *1
	40 × 40		20 mm	AC 2-wire	TL-N20MY1 2M *1	TL-N20MY2 2M *1

^{*1.} Models with a different frequency are available to prevent mutual interference. The model numbers are TL- \Box M \Box 5 (e.g., TL-N5ME15).

^{*2.} Models are also available with robotics (bend resistant) cables . Add "-R" to the model number. (e.g., TL-Q5MD1-R 2M)

 $^{^{\}star}2$. Models are also available with robotics (bend resistant) cables . Add $^{\circ}-R$ to the model number. (e.g., TL-Q5MC1-R 2M)

Accessories (Order Separately)

Mounting Brackets A Mounting Bracket is provided with the Sensor depending on the model number. Check the column for the applicable Sensor. [Refer to *Dimensions* on page 11.]

Туре	Model	Applicable Sensors		
Туре	Woder	Provided with these Sensors	Order separately	
	Y92E-C5	TL-N5ME□, TL-N7MD□	TL-N5MY□	
Mounting Brackets	Y92E-C10	TL-N10ME□, TL-N12MD□, TL-N10MF1□	TL-N10MY□	
	Y92E-C20	TL-N20ME□, TL-N20MD□	TL-N20MY□	
Mounting Brackets for Conduits	Y92E-N5C15		TL-N5ME□, TL-N5MY□	
Mounting Brackets for Conduits	Y92E-N10C15		TL-N10ME□, TL-N10MY□	

Ratings and Specifications

DC 2-Wire Models

Item	Model	TL-Q5MD□	TL-N7MD□	TL-N12MD□	TL-N20MD□	
Sensing d	istance	5 mm ±10%	7 mm ±10%	12 mm ±10%	20 mm ±10%	
Set distan	се	0 to 4 mm	0 to 5.6 mm	0 to 9.6 mm	0 to 16 mm	
Differentia	al travel	10% max. of sensing distance				
Detectable	e object	Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to Engineering Data on page 5.)				
Standard s	sensing	Iron, 18 × 18 × 1 mm	Iron, $30 \times 30 \times 1$ mm	Iron, 40 × 40 × 1 mm	Iron, 50 × 50 × 1 mm	
Response frequency		500 Hz			300 Hz	
Power supply voltage (operating voltage range) 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.						
Leakage c	urrent	0.8 mA max.				
Control	Load current	3 to 100 mA				
output	Residual voltage	3.3 V max. (Load current: 100 mA, Cable length: 2 m)				
Indicators D1 Models: Operation indicator (red), Setting indicator (green) D2 Models: Operation indicator (red)						
Operation (with sens approachi	ensing object DI Models: NO Refer to the timing charts under I/O Circuit Diagrams on page 7 for details.					
Protection	circuits	Load short-circuit protection, Surg	ge suppressor			
Ambient temperatu	re range	Operating/Storage: -25 to 70°C (with no icing or condensation)			
Ambient humidity r	ange	Operating/Storage: 35% to 95% (with no condensation)			
Temperatu	ure influence	±10% max. of sensing distance a	t 23°C in the temperature range of	–25 to 70°C		
Voltage in	fluence	±2.5% max. of sensing distance a	t rated voltage in the rated voltage	±15% range		
Insulation	resistance	50 M Ω min. (at 500 VDC) betwee	n current-carrying parts and case			
Dielectric	strength	1,000 VAC for 1 min between cur	rent-carrying parts and case			
Vibration resistance	•	Destruction: 10 to 55 Hz, 1.5-mm	double amplitude for 2 hours each	in X, Y, and Z directions		
Shock res	istance	Destruction: 500 m/s ² 3 times each in X, Y, and Z directions	Destruction: 1,000 m/s² 10 times	each in X, Y, and Z directions		
Degree of	protection	IEC 60529 IP67, in-house standa	rds: oil-resistant			
Connectio	n method	Pre-wired Models (Standard cable	e length: 2 m)			
Weight (pa	acked state)	Approx. 85 g	Approx. 165 g	Approx. 235 g	Approx. 330 g	
	Case		\	'	+	
Materials	Sensing surface	Heat-resistant ABS				
Accessori	es	Instruction manual	Mounting Bracket, Mounting phillips screws (M4 × 25), Instruction manual	Mounting Bracket, Mounting phillips screws (M4 × 30), Instruction manual	Mounting Bracket, Mounting phillips screws (M5 × 40) Instruction manual	

^{*} The response frequency is an average value.

Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

DC 3-Wire Models

Item	Model	TL-Q2MC1	TL-Q5MC□/TL-Q5MB1			
Sensing distance		2 mm ±15%	5 mm ±10%			
Set dista	nce	0 to 1.5 mm	0 to 4 mm			
Different	tial travel	10% max. of sensing distance				
Detectab	ole object	Ferrous metal (The sensing distance decreases with non-fe	rrous metal. Refer to Engineering Data on page 6.)			
Standard sensing object		Iron, 8 × 8 × 1 mm	Iron, $15 \times 15 \times 1$ mm			
Respons	se time		2 ms max.			
Respons frequence		500) Hz			
	upply volt- erating volt- ge)	12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.				
Current consump	ption	15 mA max. at 24 VDC (no-load)	10 mA max. at 24 VDC			
Control output	Load current	NPN open collector 100 mA max. at 30 VDC max.	TL-Q5MC: NPN open collector, 50 mA max. at 30 VDC max. TL-Q5MB: PNP open collector, 50 mA max. at 30 VDC max.			
	Residual voltage	1 V max. (under load current of 100 mA with cable length of 2 m)	1 V max. (under load current of 50 mA with cable length of 2 m) $$			
Indicator	rs	Detection indicator (red)				
	nsing object	NO	B1/C1 Models: NO C2 Models: NC			
approac		Refer to the timing charts under DC 3-Wire Models on page	7 for details.			
Protection circuits	on	Reverse polarity protection, Surge suppressor				
Ambient temperat	ture range	Operating/Storage: -10 to 60°C (with no icing or condensation)	Operating/Storage: –25 to 70°C (with no icing or condensation)			
Ambient humidity		Operating/Storage: 35% to 95% (with no condensation)				
Tempera influence		$\pm 10\%$ max. of sensing distance at 23°C in the temperature range of –10 to 60°C	$\pm 20\%$ max. of sensing distance at 23°C in the temperature range of –25 to 70°C			
Voltage influence	e	±2.5% max. of sensing distance at rated voltage in rated vo	ltage ±10% range			
Insulatio resistan		$50~\text{M}\Omega$ min. (at 500 VDC) between current-carrying parts and case	$5~\text{M}\Omega$ min. (at 500 VDC) between current-carrying parts and case			
Dielectri	c strength	1,000 VAC for 1 min between current-carrying parts and case	500 VAC, 50/60 Hz for 1 min between current-carrying parts and case			
Vibration resistant		Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 ho	urs each in X, Y, and Z directions			
Shock re	esistance	Destruction: 1,000 m/s² 10 times each in X, Y, and Z directions	Destruction: 200 m/s² 10 times each in X, Y, and Z directions			
Degree of protection		IEC 60529 IP67, in-house standards: oil-resistant	IEC IP67			
Connect method	ion	Pre-wired Models (Standard cable length: 2 m)				
Weight (packed	state)	Approx. 60 g	Approx. 90 g			
Materi-	Case					
als	Sensing surface	Heat-resistant ABS				
Accesso	ries	Instruction manual				
		A. C.				

^{*} The response frequency is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

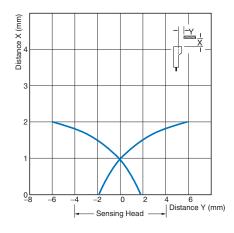
Item	Model	TL-N5ME□, TL-N5MY□	TL-N10ME□, TL-N10MY□, TL-N10MF1	TL-N20ME□, TL-N20MY□			
Sensing of	distance	5 mm ±10%	10 mm ±10%	20 mm ±10%			
Set distar	nce	0 to 4 mm	0 to 8 mm	0 to 16 mm			
Differenti	al travel	15% max. of sensing distance					
Detectable	le object	Ferrous metal (The sensing distance de	creases with non-ferrous metal. Refer to	Engineering Data on pages 6 and 7.)			
Standard sensing object		Iron, 30 × 30 × 1 mm	Iron, 40 × 40 × 1 mm	Iron, 50 × 50 × 1 mm			
Response frequency	sponse quency *1E/F Models: 500 Hz Y Models: 10 HzE Models: 40 Hz Y Models: 10 Hz						
Power su voltage *2 (operatin range)	2	E/F Models: 12 to 24 VDC (10 to 30 VD Y Models: 100 to 220 VAC (90 to 250 V					
Current consump	tion	E/F Models: 8 mA max. at 12 VDC, 15 r	nA max. at 24 VDC				
Leakage	current	Y Models: Refer to Engineering Data or	page 5.				
Control	Load current	E/F Models: 100 mA max. at 12 VDC, 2 Y Models: 10 to 200 mA	00 mA max. at 24 VDC				
output	Residual voltage	E/F Models: 1 V max. (load current: 200 Y Models: Refer to <i>Engineering Data</i> or					
Indicator	s	E/F Models: Detection indicator (red) Y Models: Operation indicator (red)					
Operation mode (with sensing object approaching) E1/F1/Y1 Models: NO E2/Y2 Models: NC Refer to the timing charts under I/O Circuit Diagrams on page 7 for details.							
Protection circuits E Models: Reverse polarity protection, Surge suppressor Y Models: Surge suppressor							
Ambient temperat	Ambient Operating/Storage: –25 to 70°C (with no icing or condensation)						
Ambient humidity	range	Operating/Storage: 35% to 95% (with no	o condensation)				
Temperatinfluence		±10% max. of sensing distance at 23°C	in the temperature range of -25 to 70°C				
Voltage i	nfluence		ance at rated voltage in rated voltage ± 1 e at rated voltage in rated voltage $\pm 10\%$				
Insulation resistanc		50 M Ω min. (at 500 VDC) between curre	ent-carrying parts and case				
Dielectric	strength		min between current-carrying parts and in between current-carrying parts and ca				
Vibration resistanc		Destruction: 10 to 55 Hz, 1.5-mm double	e amplitude for 2 hours each in X, Y, and	d Z directions			
Shock re	sistance	Destruction: 500 m/s ² 10 times each in 2	X, Y, and Z directions				
Degree of protection		IEC 60529 IP67, in-house standards: oi	l-resistant				
Connection method Pre-wired Models (Standard cable length: 2 m)		h: 2 m)					
Weight (packed s	state)	Approx. 190 g	Approx. 240 g	Approx. 340 g			
Materi- als	Case Sensing	Heat-resistant ABS					
Accessor	surface	E Models: Mounting Bracket, Mounting phillips screws (M4 × 25), Instruction manual Y Models: Instruction manual	E/F Models: Mounting Bracket, Mounting phillips screws (M4 × 30), Instruction manual Y Models: Instruction manual	E Models: Mounting Bracket, Mounting phillips screws (M5 × 40), Instruction manual Y Models: Instruction manual			

^{*1.} The response frequency is an average value. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.
*2. E Models (DC switching models): A full-wave rectification power supply of 24 VDC ±10% (average value) can be used.

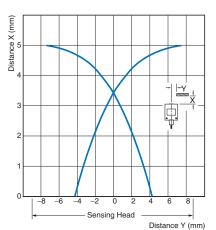
Engineering Data (Reference Value)

Sensing Area

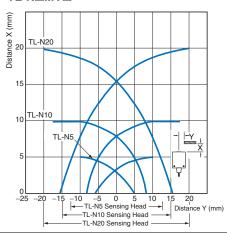
TL-Q2MC1



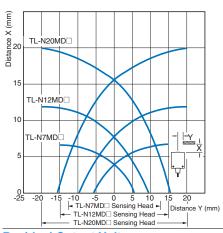
TL-Q5M□□



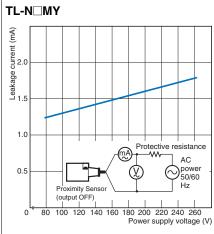
TL-N ME TL-N MY



 $\mathsf{TL} ext{-}\mathsf{N}\square\mathsf{MD}\square$

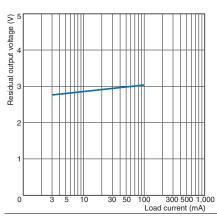


Leakage Current

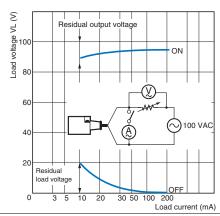


Residual Output Voltage

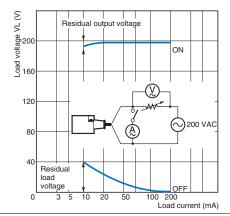
TL-N□MD



TL-N□MY at 100 VAC

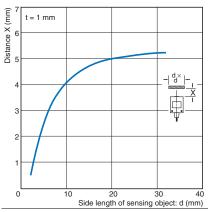


TL-N□MY at 200 VAC



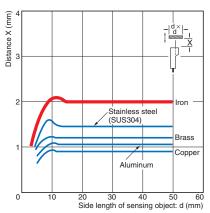
Sensing Object Size vs. Sensing Distance

TL-Q5MC□

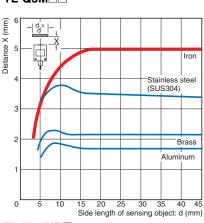


Influence of Sensing Object Size and Material

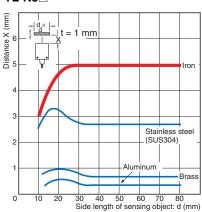
TL-Q2MC1



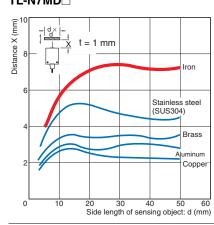
TL-Q5M□□



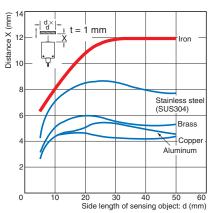
TL-N5□



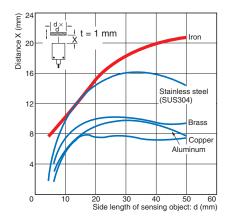
TL-N7MD



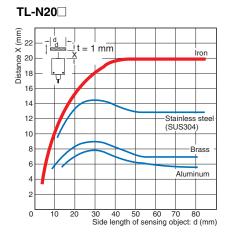
TL-N12MD□



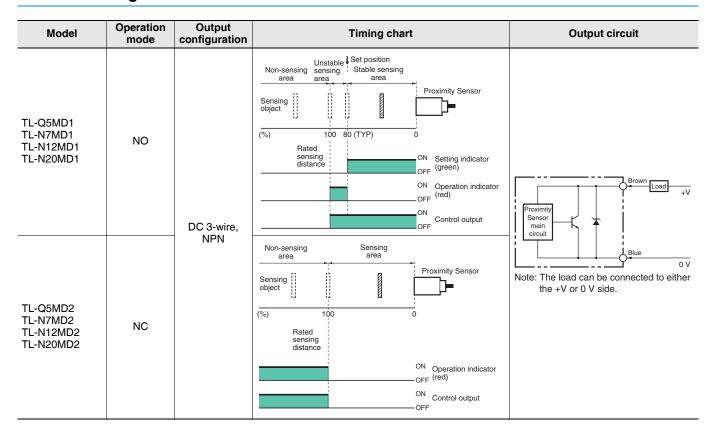
TL-N20MD□



TL-N10 Representation of the control of the contr



I/O Circuit Diagrams



TL-N/TL-Q

Model	Operation mode	Output configuration	Timing chart	Output circuit
TL-Q2MC1 TL-Q5MC1	NO	DC 3-wire,	Sensing object Not present Output transistor (load) Detection indicator (red) OFF	Proximity Sensor main circuit Output
TL-Q5MC2	NC	NPN	Sensing object Not present Output transistor (load) OFF Detection indicator (red) Present ON ON OFF	* Load current: 100 mA max., TL-Q5MC1 Load current: 50 mA max., TL-Q5MC1
TL-Q5MB1	NO	DC 3-wire, PNP	Sensing object Not present Output transistor (load) Detection indicator (red) OFF	Proximity Sensor Output Output Load Current: 50 mA max.
TL-N5ME1 TL-N10ME1 TL-N20ME1	NO	DC 3-wire,	Sensing object Not present Load (between brown and black leads) Output voltage (between black and blue leads) Detection indicator (red) Present Not present Present Not present Operate All public present Not present Not present Operate All public present ON OFF	Proximity Sensor main circuit 2.2 Ω Output Tr
TL-N5ME2 TL-N10ME2 TL-N20ME2	NC	NPN	Sensing object Not present Load (between brown and black leads) Output voltage (between black and blue leads) Detection indicator (red) Present Not present Not present Not present High Low ON OFF	*1. Load current: 200 mA max. *2. When a transistor is connected.
TL-N10MF1	NO	DC 3-wire, PNP	Sensing object Not present Not present Load (between black and blue leads) Output voltage (between brown and black leads) Detection indicator (red) Present Not present Operate Reset High Low ON OFF	Brown +V 2.2 Ω Black 2/ Tr Sensor main circuit 100 Ω Blue 0 V *1. Load current: 200 mA max. *2. When a transistor is connected.
TL-N5MY1 TL-N10MY1 TL-N20MY1	NO	- AC 2-wire	Sensing object Not present Load Operate Reset ON OFF	Proximity Sensor main
TL-N5MY2 TL-N10MY2 TL-N20MY2	NC		Sensing object Not present Load Operate Reset Operation indicator (red) OFF	Blue

Safety Precautions

Refer to Warranty and Limitations of Liability.

MARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



- Do not short-circuit the load, otherwise the Sensor may be damaged.
- Do not supply power to the Sensor with no load, otherwise the Sensor may be damaged.
 Applicable Models: AC 2-Wire Models



Precautions for Correct Use

Do not use this product under ambient conditions that exceed the ratings.

Design

Influence of Surrounding Metal

When mounting the Sensor within a metal panel, ensure that the clearances given in the following table are maintained. Failure to maintain these distances may cause deterioration in the performance of the Sensor.



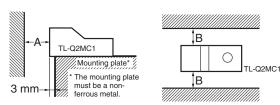




Influence of Surrounding Metal (Unit: mm)

Model	Distance	Α	B *1
TL-Q5M□□, TL-Q5MB1		20	20
TL-N7MD□		40	35
TL-N12MD□		50	40
TL-N20MD□		70	60
TL-N5ME□, TL-N5MY□		20	23
TL-N10ME□, TL-N10MF1, TL-N	10MY□	40	30
TL-N20ME□, TL-N20MY□		80	45

- *1. The B dimension applies to the top, right-side, and left-side surfaces.
- *2. The values for A or B for the TL-N apply when there is metal on only one side of the sensor. If there is metal on two or more sides of the sensor, the value must be multiplied by two or more.



Influence of Surrounding Metal (Unit: mm)

Model	Distance	Α	В
TL-Q2MC1		12	3

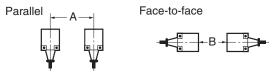
Mounting

When tightening the mounting screws, do not exceed the torque in the following table.

Model	Torque	
TL-Q2MC1	0.59 N·m	
TL-Q5M□□	0.59 N III	
TL-N\(M\) \(\)	0.9 to 1.5 N·m	

Mutual Interference

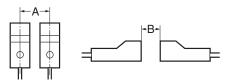
When installing Sensors face-to-face or side-by-side, ensure that the minimum distances given in the following table are maintained.



Mutual Interference (Unit: mm)

Model Distance	A *	B *
TL-Q5MC□, TL-Q5MB1	60 (17)	120 (60)
TL-Q5MD□	60 (30)	120 (80)
TL-N7MD	100 (50)	120 (60)
TL-N12MD□	120 (60)	200 (100)
TL-N20MD□	200 (100)	300 (150)
TL-N5ME	80 (40)	80 (40)
TL-N5MY□	80 (40)	90 (40)
TL-N10ME□, TL-N10MF1, TL-N10MY□	120 (60)	120 (60)
TL-N20ME□, TL-N20MY□	200 (100)	120 (60)

^{*} Values in parentheses apply to Sensors operating at different frequencies.



Mutual Interference (Unit: mm)

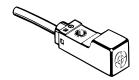
Model	Distance	A *	B *
TL-Q2MC1		30 (8)	90 (45)

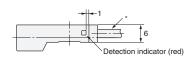
^{*} Values in parentheses apply to Sensors operating at different frequencies.

Dimensions

Sensors

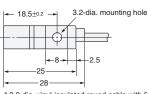
TL-Q2MC1





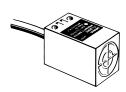
Sensing surface

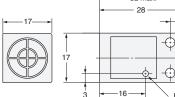


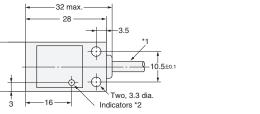


2.9-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.15 $\text{mm}^2,$ Insulator diameter: 0.9 mm), Standard length: 2 m

TL-Q5M□□







*1. B/C Models: 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.2 mm), Standard length: 2 m

D Models: 4-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.3 mm²,

Insulator diameter: 1.3 mm), Standard length: 2 m

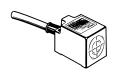
*2. B/C Models: Detection indicator (red)

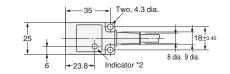
D Models: Operation indicator (red), Setting indicator (green)



Mounting Hole Dimensions

TL-N7MD□, TL-N5ME□





Mounting Hole Dimensions

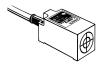


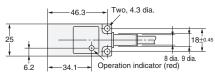


*1. D Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m E Models: 6-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m 2.0 D Models: Operation indicator (red), Setting indicator (green)

D2 Models: Operation indicator (red) E Models: Detection indicator (red)

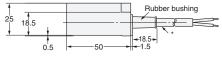
TL-N5MY





Mounting Hole Dimensions

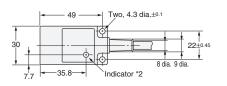




* 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m

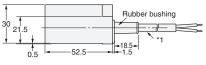
TL-N12MD□, TL-N10ME□, TL-N10MY





Mounting Hole Dimensions





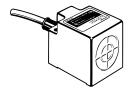
*1. D/Y Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m E/Y Models: 6-dia. vinyl-insulated round cable with 3

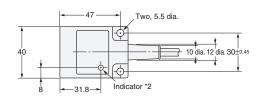
conductors (Conductor cross section: 0.5 mm2

Insulator diameter: 1.9 mm), Standard length: 2 m Operation indicator (red) and Setting indicator (green)

D2 Models: Operation indicator (red) E/Y Models: Detection indicator (red) Operation indicator (red)

TL-N20MD□, TL-N20ME□, TL-N20MY□





Mounting Hole Dimensions Two, 5.5-dia. or M5 holes 30-

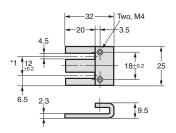
Rubber bushing

*1. D/Y Models: 6-dia. vinyl-insulated round cable with 2 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m E Models: 6-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.5 mm², Insulator diameter: 1.9 mm), Standard length: 2 m '2. D1 Models: Operation indicator (red) and Setting indicator (green) D2 Models: Operation indicator (red) E Models: Operation indicator (red) Operation indicator (red)

Accessories (Order Separately)

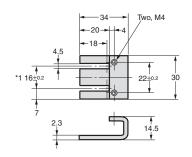
Mounting Bracket

Y92E-C5



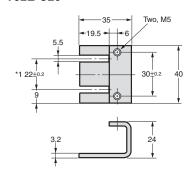
Applicable Models: TL-N5ME□ *2 Applicable Models: TL-N5MY□ Applicable Models: TL-N7MD□ *2 Material: Mounting Bracket: Zinc-plated iron Mounting Pan-head Phillips Screws: Nickel-plated iron (Size: M4, Length: 25 mm)

Y92E-C10



Applicable Models: TL-N10ME□ *2 Applicable Models: TL-N10MY□ Applicable Models: TL-N12MD□ *2 Material: Mounting Bracket: Zinc-plated iron Mounting Pan-head Phillips Screws: Nickel-plated iron (Size: M4, Length: 30 mm)

Y92E-C20

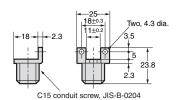


Applicable Models: TL-N20ME□ *2 Applicable Models: TL-N20MY□ Applicable Models: TL-N20MD□ *2
Material: Mounting Bracket: Zinc-plated iron
Mounting Pan-head Phillips Screws: Nickel-plated iron (Size: M5, Length: 40 mm)

- *1. These are the mounting dimensions of the base of the Mounting Bracket.

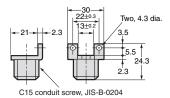
Mounting Brackets for Wiring Conduit Use (Sold Separately)

Y92E-N5C15



Applicable Models: TL-N5ME□ Applicable Models: TL-N5MY□
Applicable Models: TL-N7MD□ Material: Zinc-plated iron

Y92E-N10C15



Applicable Models: TL-N10ME□ Applicable Models: TL-N10MY□ Applicable Models: TL-N12MD□ Material: Zinc-plated iron

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